



## Smart Fans for Smarter White Goods

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Today, AC and DC fans have more demands placed on them than simply cooling and controlling airflow in white good applications. From refrigeration and freezer units to convection ovens and stove range venting ducts, white good manufacturers require high-performance, energy-efficient fans and fan trays that feature speed control, remote monitoring, low noise levels and wider operating temperature ranges— all while reducing purchase and assembly costs. AC fans, DC fans and blowers are now available with features that address the demands of low noise, low power, increased functionality and high reliability.

### Smarter fans

Designs utilizing fans with “smart” controls optimize the fan performance, while also minimizing energy consumption. Smart thermal controls can reduce power consumption by as much 30%, while reducing noise levels, as the fans only operate at full speed when needed.

Smart fan control options can also include tachometer output, airflow monitors (as an added accessory), locked rotor alarm, pulse width modulation (PWM) input, and constant speed controls. These intelligent control options allow the end users to better monitor their product operating temperatures and the fan’s airflow, while ensuring the fans are operating properly and at optimal conditions.



*Image: Airflow modules provide a cost-effective alternative for indicating airflow in AC and DC fan/blower applications*

Tachometer output, for example, provides design engineers with an accurate means of monitoring and reporting a fan's rotational speed, as well as indicating if the fan's speed falls below a certain RPM. This can be used as an alarm trigger or indicator by monitoring the fan speed to determine relative temperature. Typically, the tachometer output option is available as either a 5V TTL signal, or as an "open collector" signal.

Airflow monitors provide a cost-effective method for monitoring and maintaining proper airflow in AC and DC fan/blower applications. These modules can indicate airflow or lack thereof with an optical LED and/or audible-alarm when airflow falls below 8.2 ft/s due to fan filter clogs or interference with the fan blade. Able to mount via clip or clamp to any grill, airflow monitors are field retrofittable and can install perpendicular to the front or the intake side of the fan. With a long-operating life of more than 100,000 cycles, airflow monitors are rated to IP20, NEMA 1 certified, and have an operating temperature range of -20°C to 50°C.

DC fans and fan trays can be equipped with locked-rotor alarms indicating whether a fan is running or has stopped by transmitting a fail high or fail low output signal, minimizing fan downtime and averting an overheating situation. A PWM option also allows users to digitally control the speed of the fan through an existing bus system or PLC.

AC Fans or fan trays with thermal speed control employ a thermistor-controlled circuit that increases fan speed only when the temperature rises above a determined set-point. This reduces overall energy consumption by lowering fan speed when temperatures within the enclosure are below the set-point. Thermistor control circuits can be mounted directly in the fan hub or remotely mounted via a lead wire, and can be positioned anywhere within the enclosure, giving design engineers the flexibility to regulate fan speed based on ambient temperature in a specific area. The constant speed function senses variable input voltage, which causes variations in power output, and maintains the fan's constant speed regardless of input voltage fluctuations.



*Image: AC and DC smart control fans ensure optimal operating conditions while maximizing energy efficiency in microwave and oven applications*

### **Lowering the Volume**

Low-noise fans in refrigeration units, coolers and range hoods are being used to perform different functions while reducing the amount of noise normally present in older product designs. Low-noise fans are often selected for refrigeration and wine cooler applications to prevent condensation yet not contribute significantly to audible noise levels.

Condensation can build up on the inside of these units, forming not only on the glass, but within the enclosure itself. The use of an internal IP55-rated fan creates just enough air movement to prevent condensation. The same situation exists in store refrigeration units. Available in both AC and DC configurations, low-noise fans are employed in these applications not only to prevent condensation build-up, but also to minimize the noise level and reduce power consumption.

### **Electronically Commutated Fans**

Electronically Commutated (EC) fans utilize a brushless DC motor with a single or universal AC input. EC fans incorporate voltage transformation within the motor to provide a low power, dual speed fan. In addition, EC fans are programmable to deliver even more power savings. Well suited for large refrigeration units and chillers, EC fans offer a low power, energy-efficient cooling solution.

### **Harshest Environments**

Components exposed to harsh environments including high heat are susceptible to failure over time, with fans being no exception. The classification of the insulation system is based on the lowest rated component in the system, and in many instances may be the fan. The materials and parts specified in the construction that affect the insulation class include the motor winding, the wire and the insulation on the wires, the enamel coating on the magnet wire, as well as the visible parts of the fan or fan tray such as the frame and impeller.

In white goods applications, AC and DC fans must be capable of operating within extreme temperature ranges, from cold freezers to extremely hot convection ovens. Different materials and designs are available to achieve the necessary performance and reliability across a variety of applications.

A high temperature fan with higher insulation Class B or F construction often eliminates or reduces premature failures caused by inadequate airflow in hot areas. AC fans are often utilized in high temperature applications such as oven control assemblies and forced air convection units. The temperature of Class B insulation is specified at 130°C, while the temperature of Class F insulation is specified to 155°C. These maximum temperatures at which the plastic and insulation materials are rated includes the normal temperature rise of the fan, so care must be taken to ensure these ratings are not exceeded in these types of applications.



*Image: All-metal fans, like the one shown above from Orion, are capable of employing high insulation Class F materials for use in high temperature oven applications*

All-metal AC fans satisfy size, power and compatibility issues in the most rugged white good applications, such as HVAC and commercial deep fryers. All-metal fans are resistant to high temperatures and corrosive compounds, which may facilitate longer life expectancies in harsher environments.

#### **Customization and Value Add**

Fan technology allows manufacturers to customize their fans, fan trays and blowers to meet application requirements. Whether it's the airflow, noise level, alarm output, IP-rating/NEMA protection, or a special feature, fan manufacturers can meet the specification required.

Not all fan manufacturers offer on-site connector, harness and bracket assembly that simplify the fan installation process for white good manufacturers. Fully assembled and tested fan trays provide white good manufacturers with additional benefits by lowering supply chain costs, reducing lead times on materials, reducing the number of SKUs, reducing parts inventory, simplifying installation, improving quality and lowering overall production costs. Not only does the tray provide a complete solution, it reduces part numbers and stocked inventory of cooling parts from tens to one. Tray manufacturers like Orion Fans also assemble, test and ship when needed, further reducing lengthy lead times.

#### **Conclusion**

With more capabilities available than ever before, including higher temperature ranges, speed controls and tachometer output signals to name a few, manufacturers of white goods are using fans as a means of providing increased functionality, maximizing energy efficiency and decreasing end unit cost.